Abstract of the Disclosure

The subject invention pertains to a method and device for producing large area single crystalline III-V nitride compound semiconductor substrates with a composition $Al_xIn_yGa_{1-x-y}N$ (where $0 \leq x \leq 1$, $0 \leq y \leq 1$, and $0 \leq x + y \leq 1$). In a specific embodiment, GaN substrates, with low dislocation densities (~10^7 cm^2) can be produced. These crystalline III-V substrates can be used to fabricate lasers and transistors. Large area free standing single crystals of III-V compounds, for example GaN, can be produced in accordance with the subject invention. By utilizing the rapid growth rates afforded by hydride vapor phase epitaxy (HVPE) and growing on lattice matching orthorhombic structure oxide substrates, good quality III-V crystals can be grown. Examples of oxide substrates include $LiGaO_2$, $LiAlO_2$, $MgAlScO_4$, Al_2MgO_4, and $LiNdO_2$. The subject invention relates to a method and apparatus, for the deposition of III-V compounds, which can alternate between MOVPE and HVPE, combining the advantages of both. In particular, the subject hybrid reactor can go back and forth between MOVPE and HVPE *in situ* so that the substrate does not have to be transported between reactor apparatus and, therefore, cooled between the performance of different growth techniques.